For each i /* rows */

for each j /* columns */

for each u /* u = 0, 1, ..., k */

$$MM_u(i,j) = M_u(i,j) + \sum_{x,y} w_u(x,y) e_u(i-x,j-y)$$

endfor (u)

$$ExOut(i,j) = \operatorname*{argmin}_{c \in C} \left(\sum_u v_u |MM_u(k,l) - c_u|^p \right)^{1/p}$$

/* c_u is the (u+1)-th coordinate of c */

$$(e_0(i,j), \ldots e_k(i,j)) = (MM_0(i,j), MM_1(i,j), \ldots MM_k(i,j)) - ExOut(i,j)$$

endfor (j)

endfor (i)

Set embedded source image M_0' as the first coordinates of ExOut.

FIG.1A

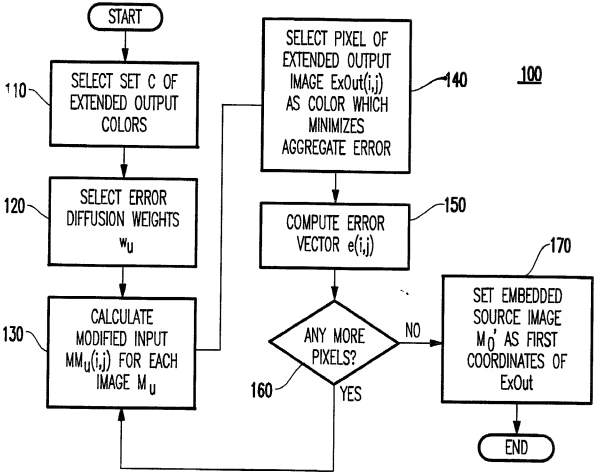
START
SELECT SET C OF EXTENDED OUTPUT COLORS
110
SELECT ERROR DIFFUSION WEIGHTS w_u
120
CALCULATE MODIFIED INPUT $MM_u(i,j)$ FOR EACH IMAGE M_u
130
SELECT PIXEL OF EXTENDED OUTPUT IMAGE ExOut(i,j) AS COLOR WHICH MINIMIZES AGGREGATE ERROR
140
100
COMPUTE ERROR VECTOR e(i,j)
150
ANY MORE PIXELS?
160
NO
YES
SET EMBEDDED SOURCE IMAGE M_0' AS FIRST COORDINATES OF ExOut
170
END

FIG.1B

FIG.2A

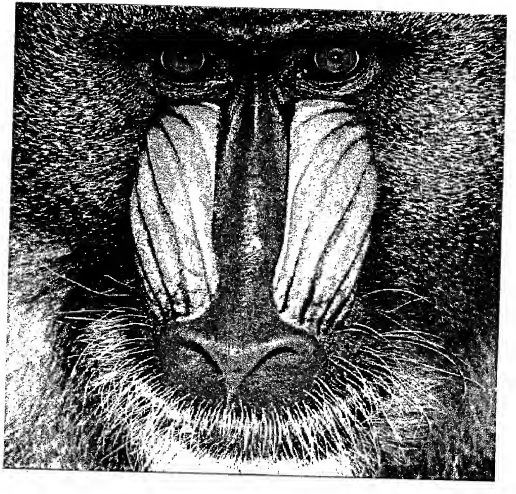

FIG.2B

FIG.2C

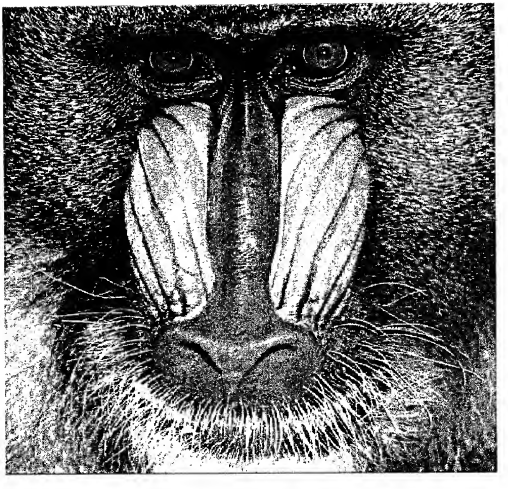

FIG.2D

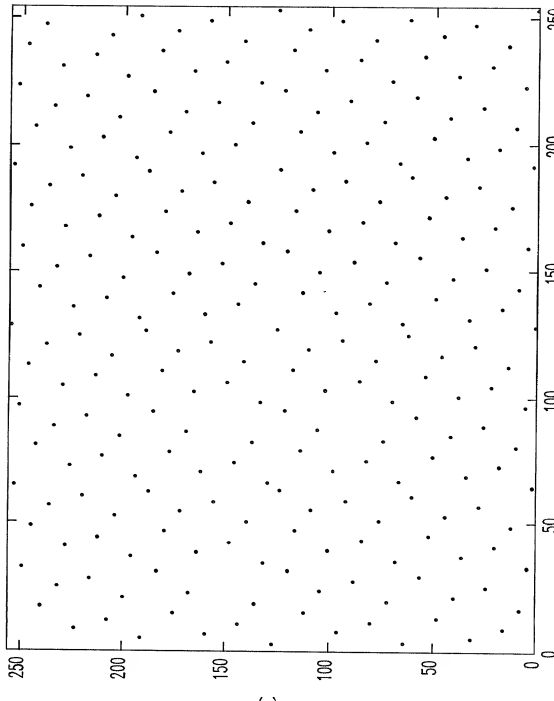

FIG.3A

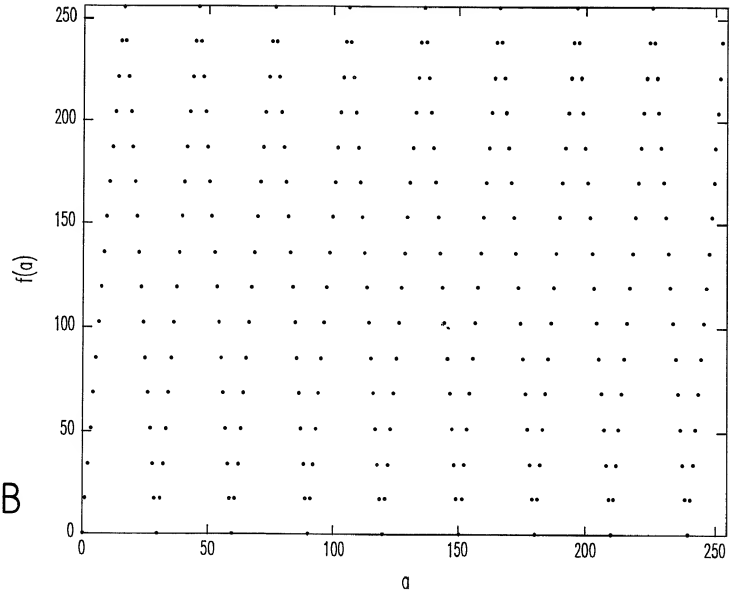

FIG.3B

FIG.4A

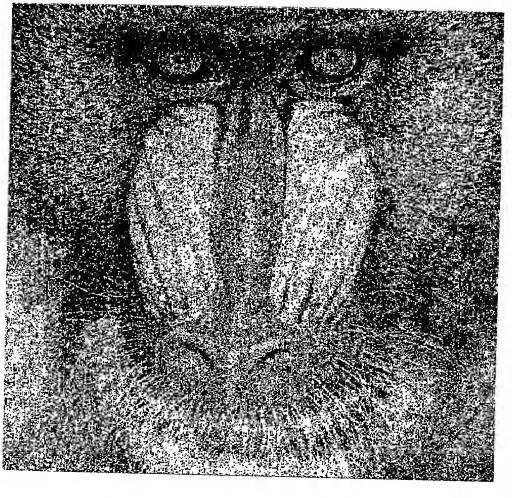

FIG.4B

```
For each iteration                          /* iteration */
    for each i                              /* rows */
        for each j                          /* column */
            for each member d of C          /* search through
                                               all possible members
                                               of C */
                set ExOut(i,j) = d
                compute
                    v(d)=| L(ExOut_0 - M_0') |^2 + | L(PExOut_1 - M_0) |^2
            endfor (d)
            set ExOut(i,j) = argmin v(d)
                             d
        endfor (j)
    endfor (i)
endfor (iteration) or until ExOut has not changed
between two consecutive iterations.
Set embedded source image M_0' as the first
coordintes of ExOut.
```

FIG.5A

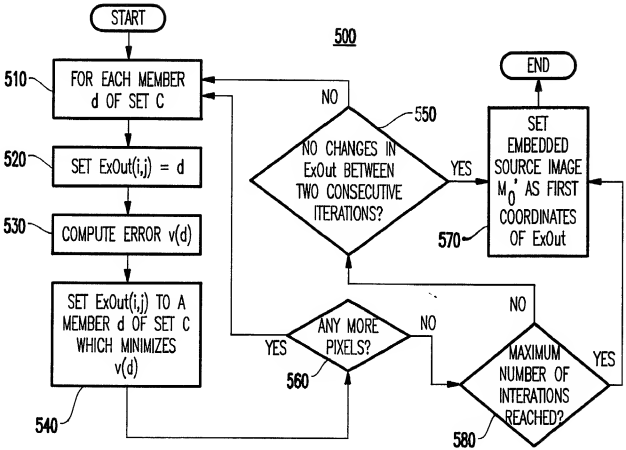
START
500
510
FOR EACH MEMBER d OF SET C
520
SET ExOut(i,j) = d
530
COMPUTE ERROR v(d)
SET ExOut(i,j) TO A MEMBER d OF SET C WHICH MINIMIZES v(d)
540
ANY MORE PIXELS?
YES
NO
560
NO CHANGES IN ExOut BETWEEN TWO CONSECUTIVE ITERATIONS?
NO
YES
550
MAXIMUM NUMBER OF INTERATIONS REACHED?
NO
YES
580
SET EMBEDDED SOURCE IMAGE M_0' AS FIRST COORDINATES OF ExOut
570
END

FIG.5B

FIG.6A

FIG.6B

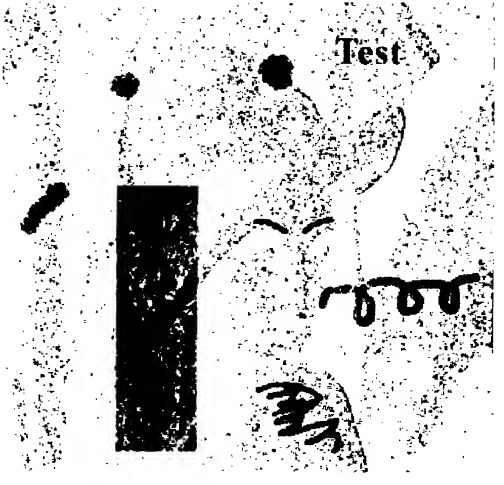

FIG.6C

FIG.6D

FIG.6E

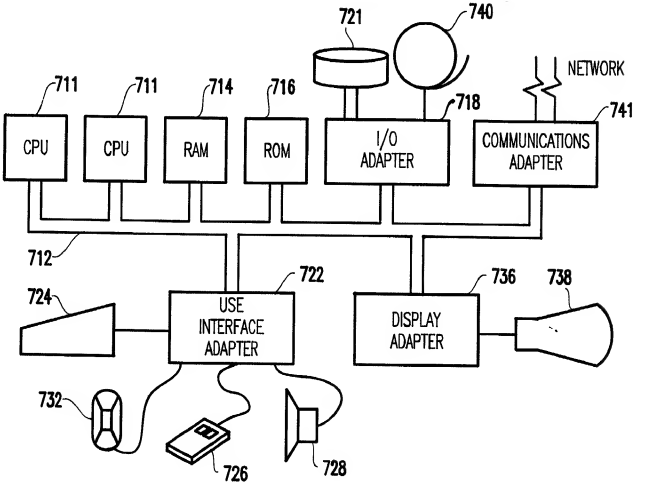
721
740
NETWORK
711
711
714
716
718
741
CPU
CPU
RAM
ROM
I/O ADAPTER
COMMUNICATIONS ADAPTER
712
722
736
738
724
USE INTERFACE ADAPTER
DISPLAY ADAPTER
732
726
728

FIG.7

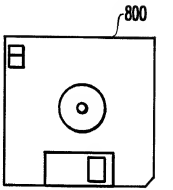
800

FIG.8